

Investigation of surface integrity in high speed machining of Ti6Al4V alloy

Amir Rasti

Department of Mechanical Engineering
Tarbiat Modares University
Tehran, Iran
P.O.B. 14115-143, Tehran, Iran
a.rasti@modares.ac.ir

Mohammad Hossein Sadeghi

Department of Mechanical Engineering
Tarbiat Modares University
Tehran, Iran
P.O.B. 14115-143, Tehran, Iran
sadeghim@modares.ac.ir

Hamed Hassanpour

Department of Mechanical Engineering
Tarbiat Modares University
Tehran, Iran
P.O.B. 14115-143, Tehran, Iran
h.hassanpour@modares.ac.ir

Abstract

High-speed milling of titanium alloys is widely used in aerospace industries for its high efficiency and good quality of product. The paper empirically studies surface roughness and microhardness variations in high speed milling of Ti6Al4V alloy. The experiments were conducted using carbide end mill tool with TiAlN coating and 6 millimeter diameter. Minimum quantity lubrication method was used in order to lubricating the cutting zone and reducing the cutting fluid consumption. Full factorial method was used to design of experiments and analyze the effect of machining parameters including cutting speed and feed rate on surface roughness and microhardness. The other cutting parameters i.e. axial depth of cut and radial depth of cut were constant. The results showed that a high quality surface with roughness of 0.2 μm can be obtained by using high speed machining method. Also, microhardness variations versus cutting speed has two-fold nature. It indicates that firstly, by increasing cutting speed up to 375 m/min, microhardness increases and after that, it declines remarkably. In addition, by increasing feed rate, surface microhardness rises and the maximum microhardness was obtained in cutting speed of 375 m/min and feed rate of 0.08 mm/tooth, which showed 57% increase.

Keywords

High Speed Milling, Ti6Al4V Alloy, Surface Integrity, Minimum Quantity Lubrication

Biography

Amir Rasti is PhD student in Production and Manufacturing Engineering in Department of Mechanical Engineering at the Tarbiat Modares University, Tehran, IRAN. He earned B.S. in Mechanical Engineering from Amirkabir University of Technology, Tehran, Masters in Production and Manufacturing Engineering from Amirkabir University of Technology, Tehran. He has published journal and conference papers. His research interests include machining, surface integrity, FEM simulation, and welding.

Mohammad Hossein Sadeghi is Professor in Mechanical and Manufacturing Engineering in Department of Mechanical Engineering at the Tarbiat Modares University, Tehran, IRAN. He has published over 100 journal and conference papers. His research interests include machining, surface integrity, FEM simulation, and forging.

Hamed Hassanpour is PhD student in Production and Manufacturing Engineering in Department of Mechanical Engineering at the Tarbiat Modares University, Tehran, IRAN. He earned B.S. in Mechanical Engineering from Babol University, Babol, Masters in Production and Manufacturing Engineering from Tarbiat Modares University, Tehran. He has published journal and conference papers. His research interests include high speed machining, surface integrity, FEM simulation.